Development of new metallic wires by powder metallurgical routes for sustainable aerospace materials

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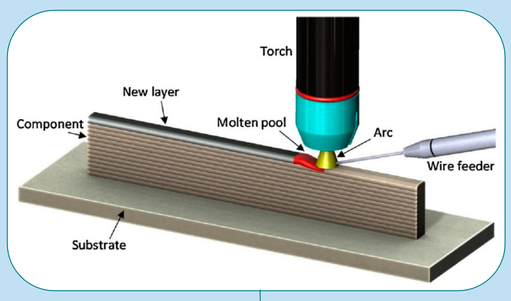
Is sustainable air travel possible?

THE AEROSPACE INDUSTRY SEEKS TO REDUCE WEIGHT, MAXIMIZE PERFORMANCE, AND LOWER EMISSIONS

LATEST TECHNOLOGY IN PRODUCTION: WIRE ARC ADDITIVE MANUFACTURING



It is limited by the commercialization of metallic wires

NEW WIRE Al-Cu-Li

3 $2s^1$ Li Lithium 6,941

- ✓ The addition of lithium significantly reduces the density while increasing strength
- ✓ Reducing density, reduced aircraft weight, fuel economy, and cost savings

METODOLOGY

POWDER → 1 Green compact from the powder → COMPACT → 2 Heat treatment N_2 atm → COMPACT → 3 Hot extrusion process (525 ºC) → ROD

RESULTS

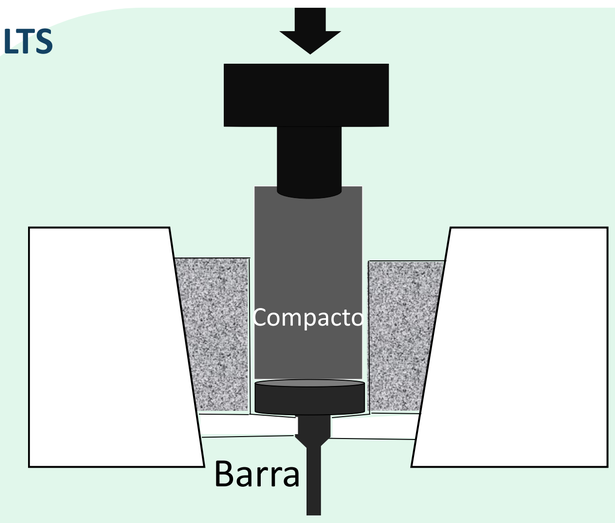


Fig. 1 Extrusion process to obtain bars from compacts.

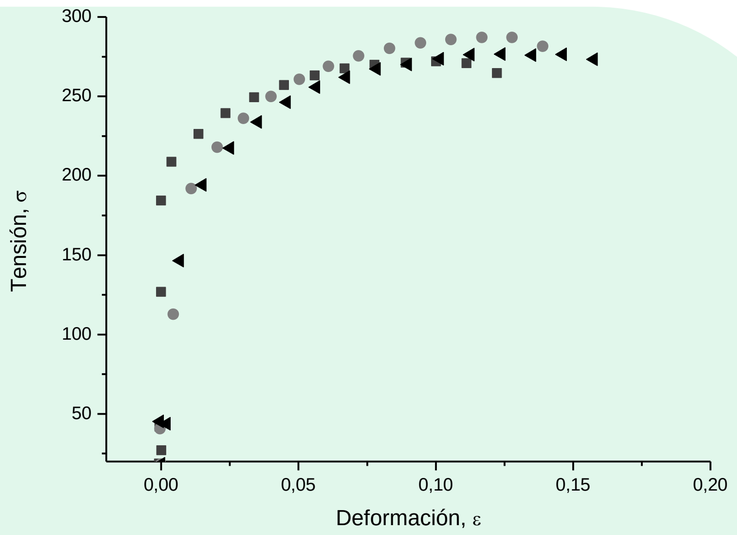


Fig. 2 Tensile test of the bars to know the ductility. Ductility is important for obtaining the wire in the next drawing step.

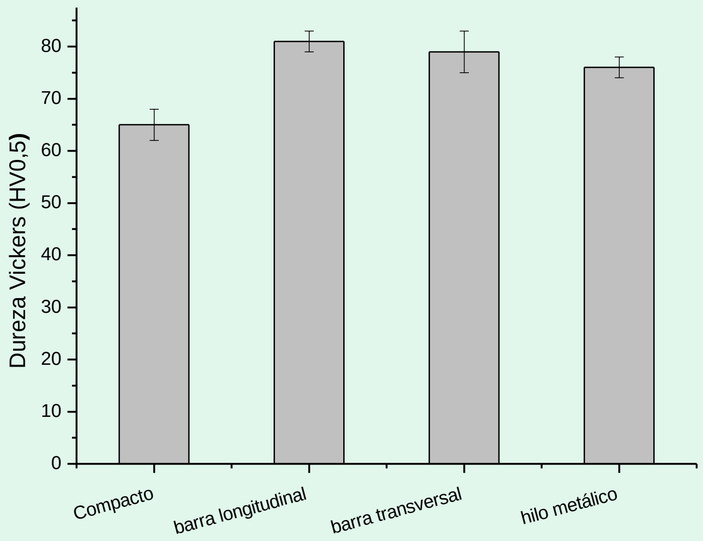


Fig. 3 Microhardness testing of compact, bar and wire.

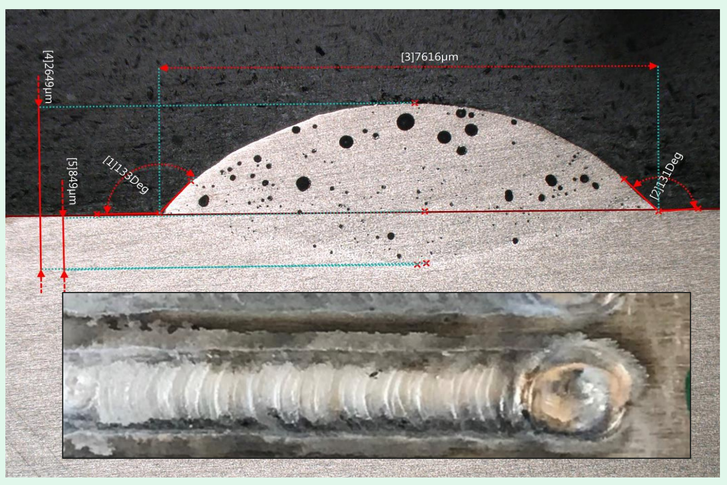


Fig. 4 Single track of the bead designed by powder metallurgical techniques applied to Wire Arc Additive Manufacturing.

CONCLUSIONS

The successes of this work demonstrate that the development of a metallic wire from powder metallurgical routes is possible.

Tensile tests reveal a bar ductility of 14%. These values are important for the subsequent treatments to obtain the wire.

Microhardness tests show that the mechanical properties are kept during the process.

In the first tests of deposition by additive manufacturing techniques, the porosity is observed, typical of aluminum beads, this result can be improved with the optimization of the process parameters and new chemical compositions of the wire that improve the final welding properties.

Sustainability

- ✓ Powder metallurgical routes allow modifying the chemical composition and adapting it to current needs with the maximum use of the material.
- ✓ Development of a new lightweight metallic wire with high strength that reduces weight in structural components, saving fuel and protecting the environment.

Bibliografía

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